

# Using Spatial Data in the Application Process<sup>1</sup>

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**Abstract.** The Virginia Department of Mines, Minerals, and Energy (DMME), Division of Mined Land Reclamation is using an electronic permitting (EP) application to incorporate both applicant and department spatial data into a Geographic Information System (GIS). Integration of this data into a GIS facilitates decision-making and expedites portions of the review process.

Location based application data is submitted in the form of data tables and CAD map elements. This data is extracted from the application and programmatically built into an ArcView project containing relevant Department data. The project is launched from within the electronic application. Upon approval of the application, data submitted with the application is integrated into Department spatial data.

Additional Key Words: GIS, Permitting, CAD

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## **Agency**

The Department of Mines, Minerals and Energy's (DMME) mission is "to enhance the development and conservation of energy and mineral resources in a safe and environmentally sound manner in order to support a more productive economy in Virginia."

## **Introduction**

The Virginia Department of Mines, Minerals and Energy has developed and implemented an electronic permitting application (EP) (fig.1). One important component of the application is mapping. Maps are attached in the application to be used by technical staff during the review process. In addition to all pertinent information submitted in the application, location based information is also supplied. This location-based information is submitted in the form of database tables containing coordinate pairs. In order for technical reviewers and other staff to fully benefit from the submittal of maps and other location-based information, EP has been integrated with a standard ArcView<sup>1</sup> project that contains agency spatial data. Maps can also be viewed independently with viewers and format specific software packages.

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<sup>1</sup> Environmental Systems Research Institute (ESRI) GIS software

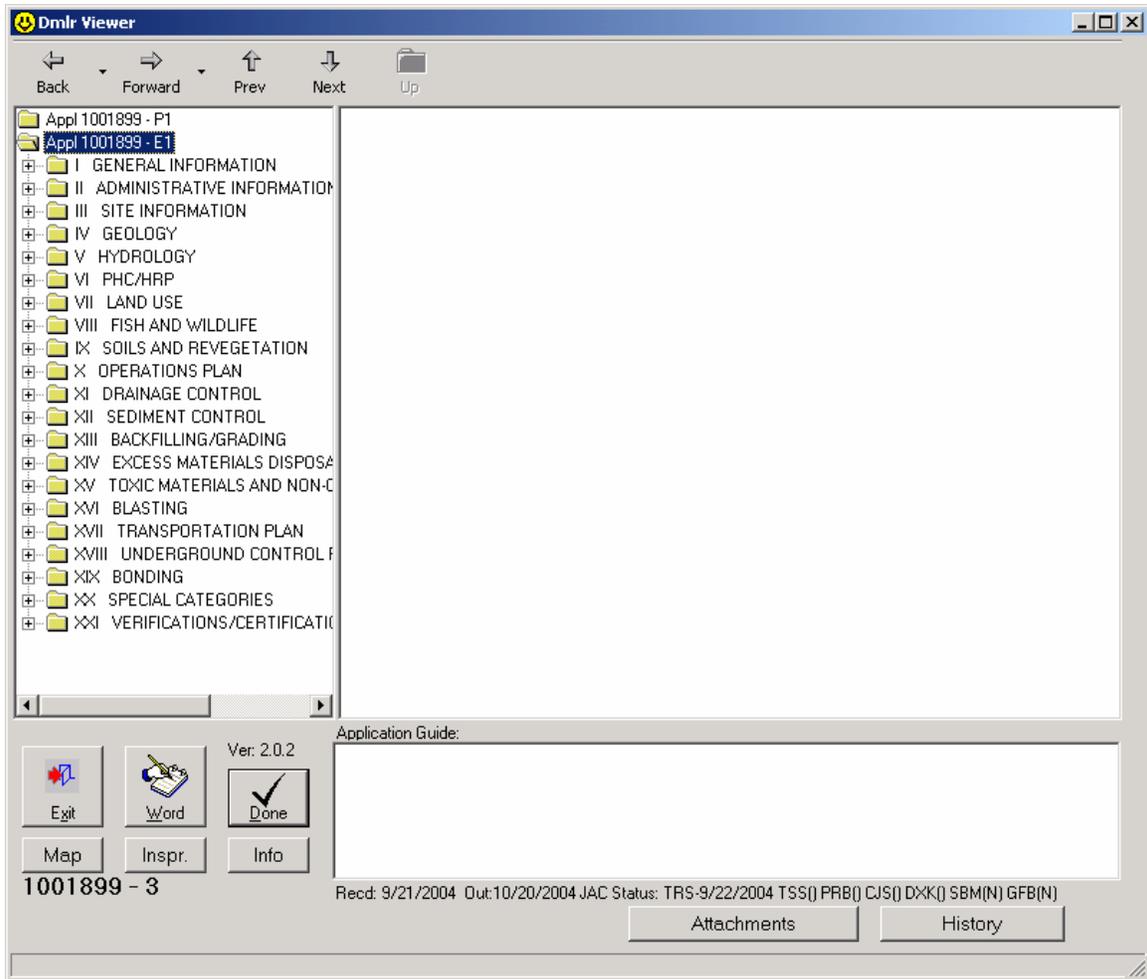


Figure 1. Electronic Permitting application

## Applicant Data

### Database Tables

Built within the application interface are forms (fig.2) for submittal of location-based points and their associated details (fig.3). The forms are actually the front-end interface for a MS Access<sup>2</sup> .mdb file. Each form contains an action field that specifies whether the referenced point will be “A” added, “C” changed, “D” deleted, or blank for no change. Upon initial processing of the application these action codes are used to determine whether these records will be included in a comma delimited text file. The text file is programmatically manipulated to automatically generate ESRI shapefiles<sup>3</sup> used in the standard ArcView project.

<sup>2</sup> Microsoft Access database format

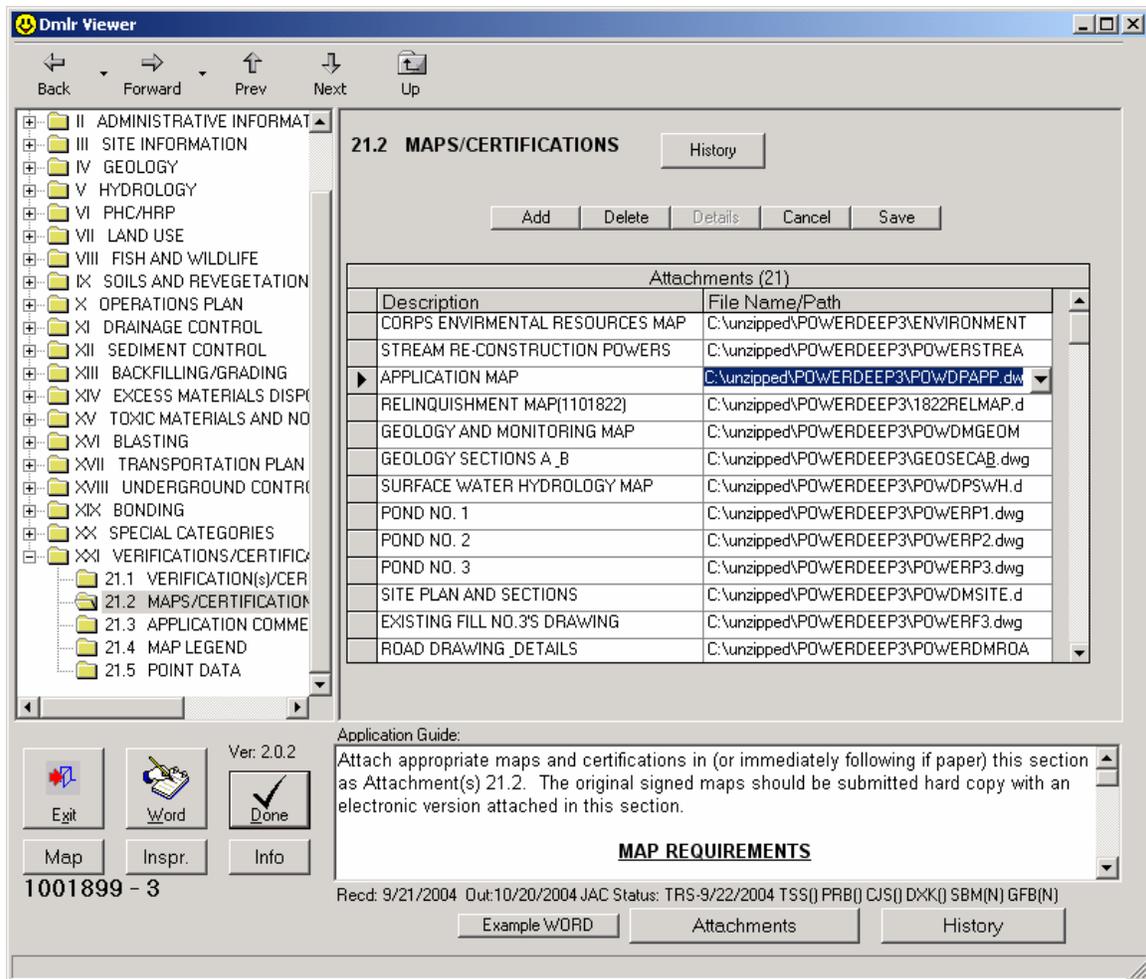
<sup>3</sup> ESRI spatial data file format



## Computer Aided Drawing

Maps are submitted electronically and are attached within the application. The format is typically AutoCAD drawing files. However, we do not intend to restrict digital submittal and will accept other formats. These maps can be viewed independently by clicking on the map link (fig.4). All technical review staff has access to a suite of AutoCAD products through a network license. Other staff without AutoCAD can open, view and print the maps in AutoCAD VoloView<sup>4</sup>. This free viewer contains some AutoCAD functionality for turning layers on and off, measuring tools, and plotting to scale.

As we do not restrict digital submittals because of format, applicants have attached maps in other formats such as .tif, .pdf, and .dwf. AutoCAD DWF format is a web-based viewer format, which requires an Internet browser plug in. The express viewer can also be launched from the map link in the application.



<sup>4</sup> Autodesk free viewer for AutoCAD drawing files

Figure 4. Maps can be launched independently with appropriate viewer by clicking on map link

One section of the permit requires a CAD drawing in order to easily extract map elements from the digital submittal. This GIS Permit Data section (fig. 5) allows DMME to update agency spatial data with applicant data upon approval of the application. This approach removes error for creation of spatial data. In the past, hardcopy maps received with application submittals would be scanned, geo-referenced, and map elements digitized to be included in agency spatial data.

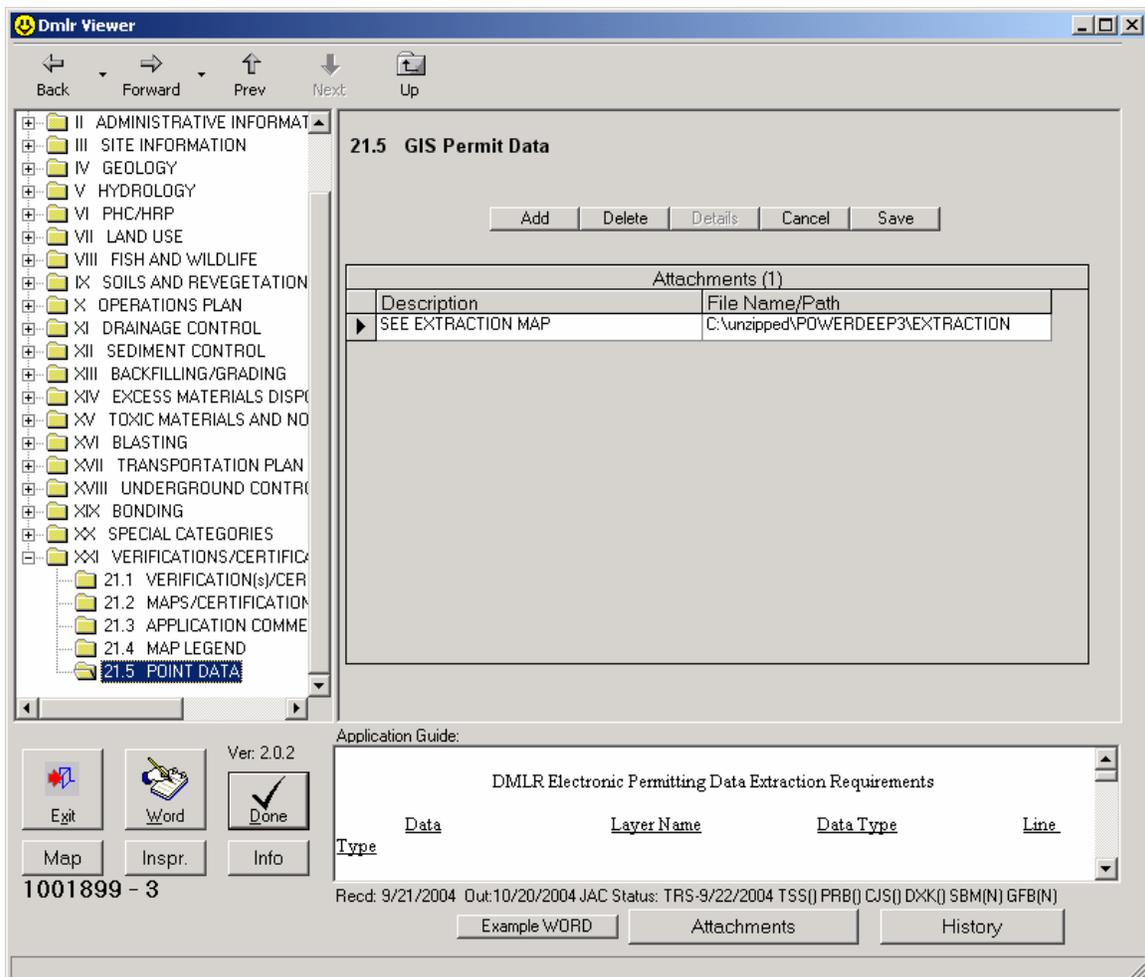


Figure 5. Section of the application used for extraction of applicant data into agency spatial data

In order to assist applicants in the correct submittal of all information, including maps, an application guide and examples are included in the application. The application guide details the required information to be shown in maps, standards for layer names, coordinate system and content.

### Department Data

DMME maintains spatial data for pertinent permitting data. This data includes permit boundaries, proposed extents of mining, water monitoring, and hollowfills. This data is primarily accessed and viewed via a customized ArcView project. Technical reviewers can access the project file by clicking on a map button (fig. 6) in the EP application.



Figure 6. Map button used by reviewers to launch ArcView project

The ArcView project file has been customized using Avenue<sup>5</sup> scripts to aide users in navigation and accessing themes not automatically loaded in the project. All location-based point data is automatically loaded as themes in the project upon launch (fig. 7). This allows reviewers to easily compare applicant submitted data with existing agency data. The data tables from the applicant input screens become the theme tables in ArcView (fig. 8).

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<sup>5</sup> ESRI proprietary programming language in ArcView 3.x platform

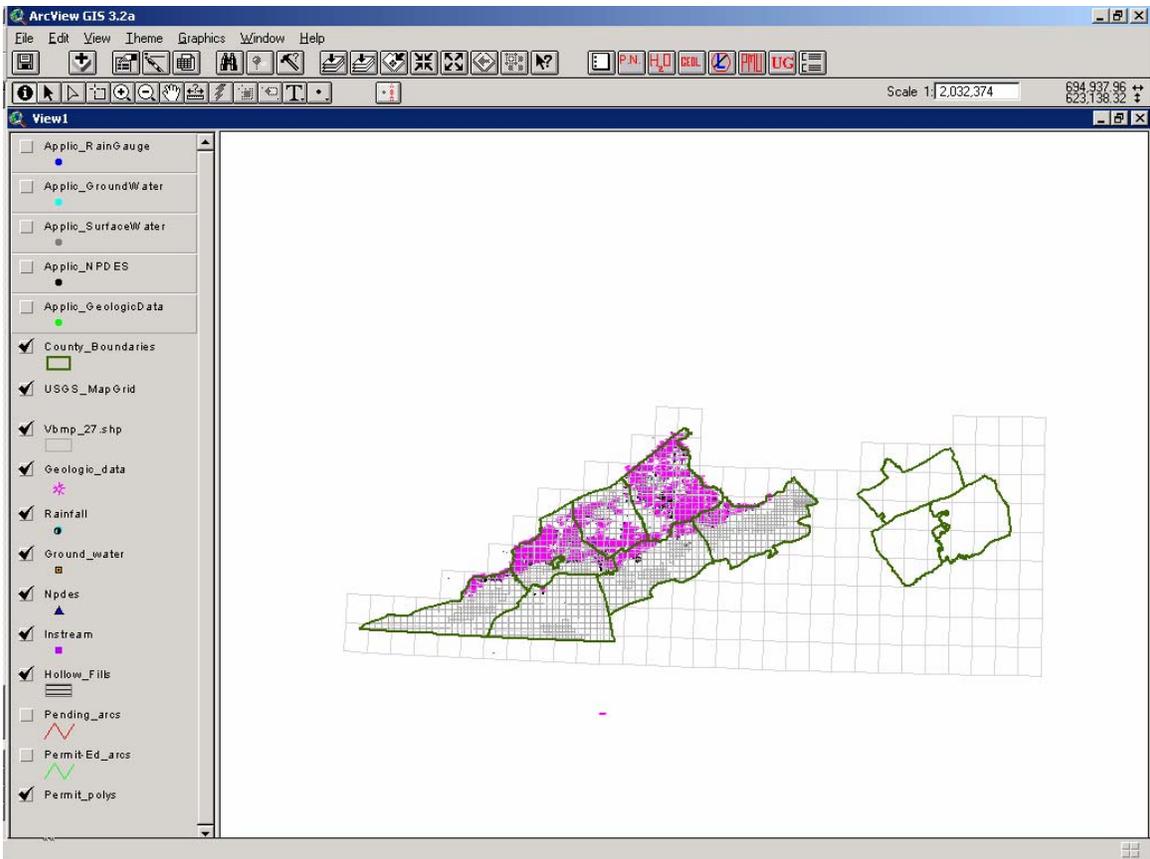


Figure 7. Customized ArcView project launched from EP

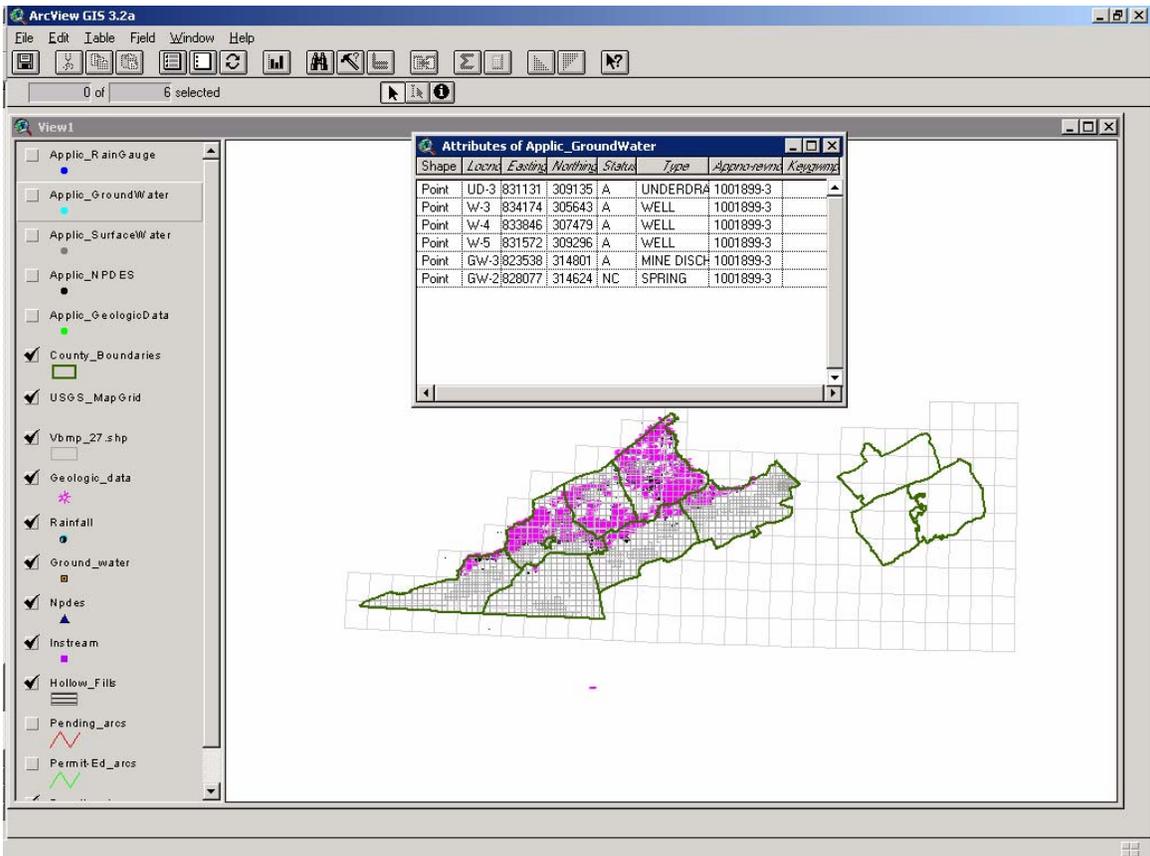


Figure 8. Theme tables associated with applicant input data

Other spatial data not automatically loaded in the project can be added for review. This can include digital orthophotos, applicant drawing files (fig. 9), and vectorized USGS topographic quadrangles. Spatial analysis can be performed using customized tools and ArcView functionally. The result being, the direct comparison of agency and applicant data is more easily accomplished (fig. 10).

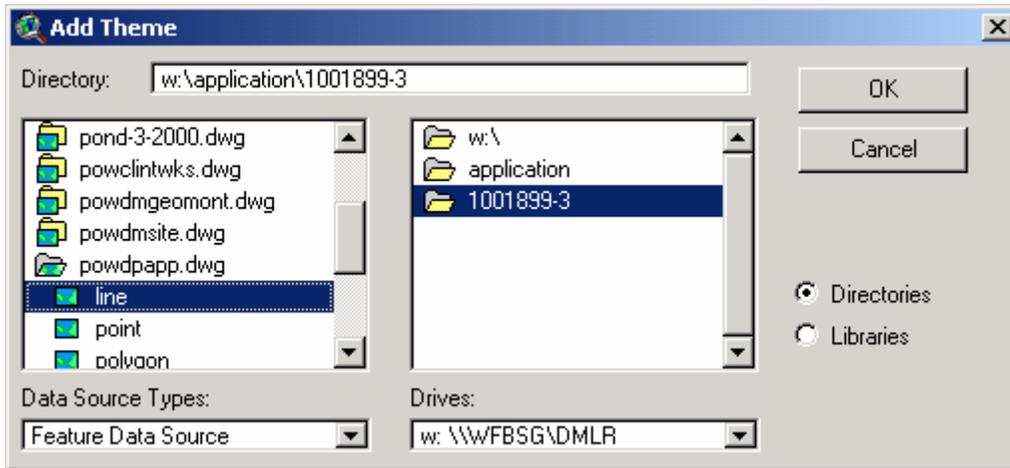


Figure 9. Adding applicant drawing file as theme in ArcView

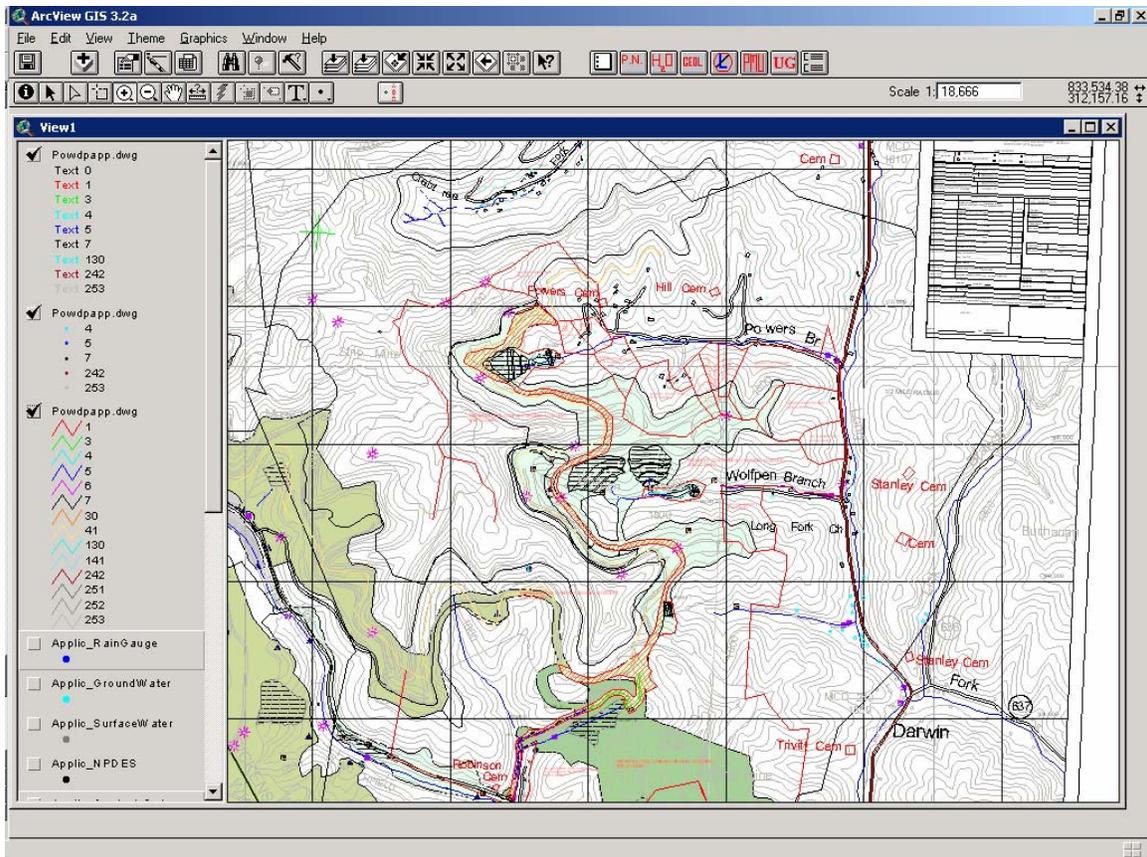


Figure 10. Application map drawing added as theme for comparison to agency data

### System Upload

Upon approval of the application, agency data is revised to include applicant data. Map elements such as point, line and polygon features are extracted from section 21.5 GIS Permit Data and used to update agency spatial data. Also, all information supplied in the application, including database tables, is uploaded into a MS SQL RDMS<sup>6</sup>. This process updates all records associated with the permit or creates records for new applications. An advantage to this is that information associated with the permit can then be linked to the spatial data for analysis or used independently for queries, reports or other agency activities.

<sup>6</sup> Microsoft SQL relational database management system

## **Conclusion**

The most important benefits of using spatial data in the review process are enhanced efficiency, effectiveness and accuracy. It facilitates a more efficient and thorough review of the application and gives reviewers an opportunity to look at components of the application that in the past were more difficult to evaluate. Increased efficiency also directly relates to a more timely review process. This not only benefits our agency, but the applicants as well. Process efficiencies also decrease the amount of time needed to update agency records and spatial data. The use of EP limits the amount of hardcopy application storage required for all application data. Information can easily be accessed, therefore saving time in the retrieval of important information. EP also provides a mechanism for the free exchange of information back to the applicants. For instance, in any subsequent revision, all data that had previously been submitted in EP is “dumped” and given back to the applicant. Therefore, they need only to make changes to portions of the permit affected by that revision.

The use of spatial data in the application process is an important part in helping DMME to support its mission “to enhance the development and conservation of energy and mineral resources in a safe and environmentally sound manner in order to support a more productive economy in Virginia.”